Earth's vast underground water supply saturated with valuable lessons

By Los Angeles Times, adapted by Newsela staff on 12.03.15
Word Count **793**

Plants grow out of dry, cracked ground that was once under water near Boulder Beach in the Lake Mead National Recreation Area near Boulder City, Nevada, May 18, 2015. AP/John Locher

Most of us think of the water cycle as something that occurs above ground. Water falls from the sky, evaporates back into the atmosphere and then condenses into rain once again.

But the water that we see above ground is just a fraction of the story.

Invisible, But Drinkable

Hidden in the Earth's crust is a huge amount of groundwater. This water fell from the sky and then trickled into the cracks and crevices in the sand, gravel and rocks beneath our feet.

We cannot see this groundwater, but more than 2 billion people across the globe rely on it for drinking water every day. In dry areas it is pumped out of the ground to grow crops. It also plays an important environmental role, keeping streams and rivers running in times of drought.

Back in the 1970s a team of scientists estimated how much of the planet's water lies buried beneath the ground. That calculation had not been updated for 40 years — until now.

In a new study that appears in the magazine Nature Geoscience, researchers tried to estimate once again how much water is stored in our planet's crust. This time, they studied tens of thousands of additional locations. They also looked at the age of that water, or how long it had been underground. That information could help them understand how quickly it can be replaced as humans keep pulling it out of the ground.

That's A Lot Of Water!

"Our maps and estimates show where the groundwater is quickly being renewed and where it is old and stagnant and nonrenewable," said Tom Gleeson, who led the study. Gleeson is a hydrogeologist, someone who studies groundwater. He works at the University of Victoria in Canada.

Gleeson and his team report that there are 6 quintillion gallons of groundwater in the upper 1.2 miles of the Earth's crust. If you could magically pump it all out of the ground and spread it across the continents, it would form a layer of water 600 feet high. That's twice the height of the Statue of Liberty.

To determine that number, the scientists used computer models. They estimated how much water can be stored in various types of rocks across the planet. They used 40,000 separate measurements to come up with their results.

The researchers were also interested in the age of the groundwater and how it was distributed. Previous studies have shown that water that has made its way into the ground could have fallen from the sky as little as a day ago, or as long as millions — even billions — of years ago.

Just How Old Is The Groundwater?

In particular, the scientists wanted to know how much of the Earth's groundwater was "modern." This younger water entered the ground system less than 50 years ago.

Researchers say there are a variety of reasons why it is important to know how much modern groundwater there is. First, it is a more renewable resource than older ground water. In many parts of the world, humans are using groundwater faster than it can be replenished. Second, it is more likely to be contaminated by chemicals used in factories or agriculture. This would make it unhealthy for human consumption.

To see how much of groundwater is "modern," they decided to look at how much tritium had been found in groundwater across the globe. Tritium is a radioactive isotope, or chemical element, of hydrogen. It increased in rain water approximately 50 years ago because of above-ground nuclear weapons testing.

The team reviewed many scientific studies. It eventually found 3,700 tritium measurements of groundwater from 55 countries.

Scientists Are Surprised

From this information they determined that just 5.6 percent of groundwater is less than 50 years old.

Gleeson said the finding that modern groundwater was such a small percentage of overall groundwater was the biggest surprise of the study.

Ying Fan of Rutgers University, who was not involved in the work, wrote an article about the research. She said that the team's findings have several implications.

First, it suggests that researchers could look at stored ancient water to learn about our planet's past.

The Flow Of History

She said that the study "hints at the sluggishness and the vastness of the world's older groundwater stores." She believes they may record the history of climate and the crust over centuries, thousands, or even millions of years.

She also thinks the results of this study could help influence how we treat the supplies of modern, renewable water in the immediate future.

Gleeson said the next step for his team is to find out how much young groundwater is being used, and where.

"We want to find out how long before we run out of this critical resource," he said.

Quiz

1 Which paragraph in the section "Invisible, But Drinkable" explains the various ways that groundwater is used?

2 Which selection from the article BEST supports the following statement?

The recent groundwater study was more extensive than those in the 1970s.

(A) This time, they studied tens of thousands of additional locations. They also looked at the age of that water, or how long it had been underground.

(B) Gleeson and his team report that there are 6 quintillion gallons of groundwater in the upper 1.2 miles of the Earth's crust.

(C) To determine that number, the scientists used computer models. They estimated how much water can be stored in various types of rocks across the planet.

(D) Gleeson said the finding that modern groundwater was such a small percentage of overall groundwater was the biggest surprise of the study.

3 Why does the author include the paragraphs in the section "Scientists Are Surprised"?

(A) to introduce another scientist who was involved in the groundwater study

(B) to explain how modern groundwater can be used efficiently

(C) to compare the difference between modern and old groundwater

(D) to provide the results of the groundwater study and explain their importance

4 How do the final two sentences of the section "The Flow Of History" contribute to the article?

(A) They explain why studying groundwater is important.

(B) They make a prediction about the outcome of future experiments.

(C) They explain what scientists will continue to study about groundwater.

(D) They make an argument about why studying groundwater should be the top priority for scientists.